

PTO/SB/21 (08-03)  
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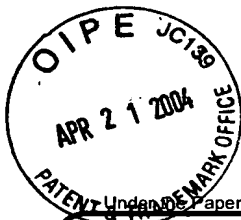
<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	10709,054	
	Filing Date	04/09/2004	
	First Named Inventor	Shao-Kang Chang	
	Art Unit		
	Examiner Name		
Total Number of Pages in This Submission	3	Attorney Docket Number	NTCP0019USA

ENCLOSURES (Check all that apply)		
<input checked="" type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance communication to Technology Center (TC)
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<input type="checkbox"/> Response to Missing Parts/Incomplete Application	Remarks	
<input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53		
<b>SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT</b>		
Firm or Individual name	Winston Hsu, Reg. No.: 41,526	
Signature	<i>Winston Hsu</i>	
Date	4/15/2004	

CERTIFICATE OF TRANSMISSION/MAILING		
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PTO/SB/17 (10-03)

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# FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$ ) 0.00

**Complete if Known**

Application Number	10/709,054
Filing Date	2004/4/9
First Named Inventor	Shao-Kang Chang
Examiner Name	
Art Unit	
Attorney Docket No.	NTCP0019USA

**METHOD OF PAYMENT (check all that apply)**☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None☒ Deposit Account:Deposit  
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☒ Charge fee(s) indicated below ☐ Credit any overpayments☒ Charge any additional fee(s) or any underpayment of fee(s)☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.**FEE CALCULATION****1. BASIC FILING FEE**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 770	2001 385	Utility filing fee	
1002 340	2002 170	Design filing fee	
1003 530	2003 265	Plant filing fee	
1004 770	2004 385	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	
SUBTOTAL (1)			(\$ ) 0.00

**2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE**

Total Claims		Extra Claims		Fee from below		Fee Paid	
Independent Claims		- 20** =		X			
Multiple Dependent		- 3** =		X			

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1202 18	2202 9	Claims in excess of 20	
1201 86	2201 43	Independent claims in excess of 3	
1203 290	2203 145	Multiple dependent claim, if not paid	
1204 86	2204 43	** Reissue independent claims over original patent	
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent	
SUBTOTAL (2)			(\$ ) 0.00

\*\*or number previously paid, if greater; For Reissues, see above

**FEE CALCULATION (continued)****3. ADDITIONAL FEES**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	1053 130	Non-English specification	
1812 2,520	1812 2,520	For filing a request for <i>ex parte</i> reexamination	
1804 920*	1804 920*	Requesting publication of SIR prior to Examiner action	
1805 1,840*	1805 1,840*	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 420	2252 210	Extension for reply within second month	
1253 950	2253 475	Extension for reply within third month	
1254 1,480	2254 740	Extension for reply within fourth month	
1255 2,010	2255 1,005	Extension for reply within fifth month	
1401 330	2401 165	Notice of Appeal	
1402 330	2402 165	Filing a brief in support of an appeal	
1403 290	2403 145	Request for oral hearing	
1451 1,510	1451 1,510	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,330	2453 665	Petition to revive - unintentional	
1501 1,330	2501 665	Utility issue fee (or reissue)	
1502 480	2502 240	Design issue fee	
1503 640	2503 320	Plant issue fee	
1460 130	1460 130	Petitions to the Commissioner	
1807 50	1807 50	Processing fee under 37 CFR 1.17(q)	
1806 180	1806 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 770	2809 385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 770	2810 385	For each additional invention to be examined (37 CFR 1.129(b))	
1801 770	2801 385	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	
Other fee (specify)			
*Reduced by Basic Filing Fee Paid			
SUBTOTAL (3)			(\$ ) 0.00

**SUBMITTED BY**

(Complete (if applicable))

Name (Print/Type)	Winston Hsu	Registration No. (Attorney/Agent)	41,526	Telephone	886289237350
Signature	<i>Winston Hsu</i>	Date	4/15/2004		

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PTO/SB/02B (11-00)  
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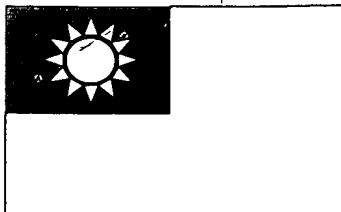
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## DECLARATION — Supplemental Priority Data Sheet

Additional foreign applications:

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
092128338	Taiwan R.O.C	10/13/2003	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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中華民國經濟部智慧財產局

INTELLECTUAL PROPERTY OFFICE  
MINISTRY OF ECONOMIC AFFAIRS  
REPUBLIC OF CHINA

茲證明所附文件，係本局存檔中原申請案的副本，正確無訛，  
其申請資料如下：

This is to certify that annexed is a true copy from the records of this  
office of the application as originally filed which is identified hereunder:

申請日：西元 2003 年 10 月 13 日  
Application Date

申請案號：092128338  
Application No.

申請人：南亞科技股份有限公司  
Applicant(s)

局長  
Director General

蔡練生

發文日期：西元 2004 年 4 月 5 日  
Issue Date

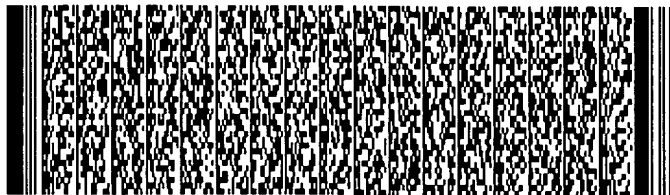
發文字號：09320308600  
Serial No.

申請日期：	IPC分類
申請案號：	

(以上各欄由本局填註)

## 發明專利說明書

一、 發明名稱	中 文	一種蝕刻液組成
	英 文	ETCHANT COMPOSITION FOR SEM IMAGE ENHANCEMENT OF P-N JUNCTION CONTRAST
二、 發明人 (共3人)	姓 名 (中文)	1. 張少康
	姓 名 (英文)	1. CHANG, SHAO-KANG
	國 籍 (中英文)	1. 中華民國 TW
	住居所 (中 文)	1. 桃園縣平鎮市民族路雙連一段一四二巷十八弄四街十七號
	住居所 (英 文)	1. No. 17, Alley 4, Alley 18, Lane 142, Sec. 1, Shuen-Lien, Ming-tsu Rd., Pin-Chen City, Tao-Yuan Hsien, Taiwan, R.O.C.
三、 申請人 (共1人)	名稱或 姓 名 (中文)	1. 南亞科技股份有限公司
	名稱或 姓 名 (英文)	1. NANYA TECHNOLOGY CORP.
	國 籍 (中英文)	1. 中華民國 TW
	住居所 (營業所) (中 文)	1. 桃園縣龜山鄉華亞科技園區復興三路六六九號 (本地址與前向貴局申請者相同)
	住居所 (營業所) (英 文)	1. HWA-YA TECHNOLOGY PARK 669, FUHSING 3 RD., KUEISHAN, Tao-Yuan Hsien, Taiwan, R.O.C.
	代表人 (中文)	1. 連日昌
	代表人 (英文)	1. LIEN, JIH

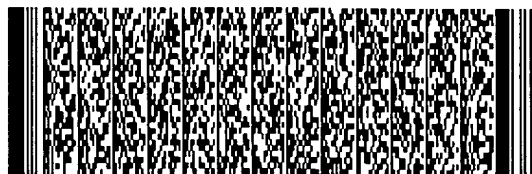


申請日期：	IPC分類
申請案號：	

(以上各欄由本局填註)

## 發明專利說明書

一、 發明名稱	中 文	
	英 文	
二、 發明人 (共3人)	姓 名 (中文)	2. 莊景誠 3. 陳逸男
	姓 名 (英文)	2. CHUANG, GRAHAM 3. CHEN, YI-NAN
	國 籍 (中英文)	2. 中華民國 TW 3. 中華民國 TW
	住居所 (中 文)	2. 桃園縣龜山鄉長庚醫護新村六十八號二樓 3. 台北市北投區建民路一五一巷四號
	住居所 (英 文)	2. 2F, No. 68, Chang Keng Yi Hu Hsin Tsun, Kuei-Shen Hsiang, Tao-Yuan Hsien, Taiwan, R.O.C. 3. No. 4, Lane 151, Chien-Min Rd., Pei-Tou, Taipei City, Taiwan,
三、 申請人 (共1人)	名稱或 姓 名 (中文)	R.O.C.
	名稱或 姓 名 (英文)	
	國 籍 (中英文)	
	住居所 (營業所) (中 文)	
	住居所 (營業所) (英 文)	
	代表人 (中文)	
	代表人 (英文)	



四、中文發明摘要 (發明名稱：一種蝕刻液組成)

本發明揭露一種SEM試片預處理蝕刻液組成，包含有NTC-1號溶液，其為含有機酸/氫氟酸/硝酸( $\text{HNO}_3$ )之A劑再與濃度49%之氫氟酸混合而成；以及NTC-2號溶液含有金屬離子以及強氧化劑；其中該NTC-1號溶液與該NTC-2號溶液係以特定體積比例混合。SEM試片在進行分析之前，先浸入本發明之獨特SEM試片預處理蝕刻液組成配方中，即可獲得半導體元件基底中之P-N接面清晰輪廓。

五、英文發明摘要 (發明名稱：ETCHANT COMPOSITION FOR SEM IMAGE ENHANCEMENT OF P-N JUNCTION CONTRAST)

An etchant composition for SEM image enhancement of P-N junction contrast is disclosed. The composition comprises an NTC-1 solution mixed with an NTC-2 solution at a selected volumetric ratio. The NTC-1 solution is prepared by mixing A solution comprising organic acid, HF, and nitric acid with 49% HF solution. The NTC-2 solution comprises metal ions and a



四、中文發明摘要 (發明名稱：一種蝕刻液組成)

五、英文發明摘要 (發明名稱：ETCHANT COMPOSITION FOR SEM IMAGE ENHANCEMENT OF P-N JUNCTION CONTRAST)

strong oxidant. After the preparation of the NTC-1/NTC-2 solution, they are mixed together at specific volumetric ratio. Before carrying out a SEM analysis, the SEM specimen is dipped into the etchant composition.





六、指定代表圖

(一)、本案代表圖為：第 圖

(二)、本案代表圖之元件代表符號簡單說明

本申請案無圖式



一、本案已向

國家(地區)申請專利

申請日期

案號

主張專利法第二十四條第一項優先權

無

二、☐主張專利法第二十五條之一第一項優先權：

申請案號：

無

日期：

三、主張本案係符合專利法第二十條第一項☐第一款但書或☐第二款但書規定之期間

日期：

四、☐有關微生物已寄存於國外：

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寄存機構：

寄存日期：

寄存號碼：

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☐熟習該項技術者易於獲得,不須寄存。



## 五、發明說明 (1)

### 發明所屬之技術領域

本發明係關於一種蝕刻液(etchant)組成，尤指一種應用在掃描式電子顯微鏡(Scanning Electron Microscopy, SEM)技術中可用以顯現出半導體元件基底中之P-N接面輪廓的SEM試片預處理蝕刻液組成。

### 先前技術

如該行業者所熟知，在半導體元件分析技術中，掃描式電子顯微鏡(SEM)可用來分析積體電路剖面結構，例如，對於溝渠式動態記憶體元件而言，掃描式電子顯微鏡可以觀察溝渠電容結構。習知利用掃描式電子顯微鏡觀察溝渠式動態記憶體元件的溝渠電容剖面結構影像前，通常需要將試片(specimen)預先浸入一種蝕刻酸液中，例如業界所通稱的Oki酸或Flou酸，用以侵蝕溝渠電容中的多晶矽，以方便在掃描式電子顯微鏡分析過程中形成清晰的對比影像。其中，如熟習該項技藝者所知，Oki酸的配方係為體積比200:1的硝酸：49%氫氟酸(HF)。

在某些情況下，利用掃描式電子顯微鏡觀察溝渠電容結構的同時，若能夠在照片中顯現出P-N接面輪廓更好。然而，上述習知前處理酸液卻無法達到如此的功效。鑑於此，申請人乃結合學理及多年累積之工作經驗法則研發



## 五、發明說明 (2)

出一種可使半導體元件基底中之P-N接面剖面輪廓可以透過掃描式電子顯微鏡獲得清晰觀察之獨特配方。

### 發明內容

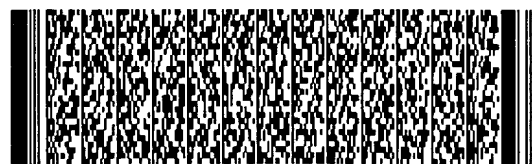
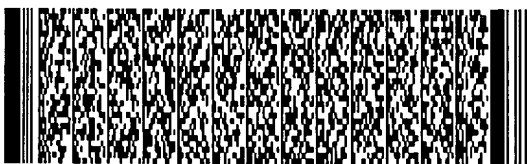
本發明之主要目的在於提供一種可使半導體元件基底中之P-N接面輪廓得透過掃描式電子顯微鏡獲得清晰觀察之獨特SEM試片預處理蝕刻液組成配方。

根據本發明之較佳實施例，本發明揭露一種蝕刻液組成，包含有NTC-1號溶液，其為含有機酸/氫氟酸/硝酸( $\text{HNO}_3$ )之A劑再與濃度49%之氫氟酸混合而成；以及NTC-2號溶液含有金屬離子以及強氧化劑；其中該NTC-1號溶液與該NTC-2號溶液係以特定體積比例混合。

為了使貴審查委員能更近一步了解本發明之特徵及技術內容，請參閱以下有關本發明之詳細說明與附圖。然而所附圖式僅供參考與輔助說明用，並非用來對本發明加以限制者。

### 實施方式

本發明之一種可使半導體元件基底中之P-N接面輪廓得透過掃描式電子顯微鏡獲得清晰觀察之獨特SEM試片預處理



### 五、發明說明 (3)

蝕刻液組成配方係由兩種預先摻配之溶液以特定體積比例混合而成，以下分別稱為NTC-1號溶液以及NTC-2號溶液。

根據本發明之較佳實施例，NTC-1號溶液含有體積比由1 : 1 : 4至1 : 1 : 25範圍之有機酸：氫氟酸：硝酸( $\text{HNO}_3$ )之A劑再以體積比2 : 1至5 : 1之比例與濃度49%之氫氟酸混合而成。其中，有機酸可以為蟻酸(formic acid)、醋酸(HAc)、丙酸等，較佳為醋酸。NTC-2號溶液含有金屬離子以及強氧化劑。金屬離子可為銅離子、鎂離子、鋁離子、鈣離子、鋅離子等，又以銅離子較佳。強氧化劑可以為雙氧水、臭氧、硫酸等等，而以硫酸(sulfuric acid)較佳。依據本發明之較佳實施例，NTC-2號溶液係將0.005M至0.02M之硝酸銅溶液以體積比2 : 1至5 : 1之比例與硫酸(90%)溶液混合而成。

本發明之一種可使半導體元件基底中之P-N接面輪廓得透過掃描式電子顯微鏡獲得清晰觀察之獨特SEM試片預處理蝕刻液組成配方係將上述兩種預先摻配之溶液：NTC-1號溶液以及NTC-2號溶液，以特定體積比例混合而成。依據本發明之較佳實施例，NTC-1號溶液以及NTC-2號溶液之混合比例介於體積比1 : 1至1 : 5之間。SEM試片在進行分析之前，先浸入本發明之獨特SEM試片預處理蝕刻液組成配方中，即可獲得半導體元件基底中之P-N接面清晰輪

#### 五、發明說明 (4)

廓。

以上所述僅為本發明之較佳實施例，凡依本發明申請專利範圍所做之均等變化與修飾，皆應屬本發明專利之涵蓋範圍。



圖式簡單說明

圖式之簡單說明

本申請案無圖式

圖式之符號說明

本申請案無符號說明



## 六、申請專利範圍

1. 一種蝕刻液組成，包含有：

NTC-1 號溶液，其為含有機酸/ 氫氟酸/ 硝酸( $\text{HNO}_3$ ) 之A 劑再與濃度49% 之氫氟酸混合而成；以及

NTC-2 號溶液含有金屬離子以及強氧化劑；

其中該NTC-1 號溶液與該NTC-2 號溶液係以特定體積比例混合。

2. 如申請專利範圍第1 項所述之蝕刻液組成，其中該A 劑所含之有機酸：氫氟酸：硝酸( $\text{HNO}_3$ )，其體積比由1：1：4 至1：1：25 範圍。

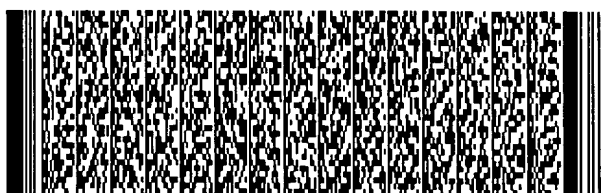
3. 如申請專利範圍第1 項所述之蝕刻液組成，其中該A 劑與該氫氟酸以體積比2：1 至5：1 之比例混合。

4. 如申請專利範圍第1 項所述之蝕刻液組成，其中該有機酸包含蟻酸(formic acid)、醋酸(HAc) 及丙酸。

5. 如申請專利範圍第1 項所述之蝕刻液組成，其中該金屬離子包含銅離子、鎂離子、鋁離子、鈣離子及鋅離子。

6. 如申請專利範圍第1 項所述之蝕刻液組成，其中該強氧化劑包含雙氧水、臭氧及硫酸。

7. 如申請專利範圍第1 項所述之蝕刻液組成，其中該NTC-





六、申請專利範圍

2 號溶液係將0.005M至0.02M之硝酸銅溶液以體積比2 : 1至5 : 1之比例與硫酸(90%)溶液混合而成。

8. 如申請專利範圍第1項所述之蝕刻液組成，其中該NTC-1號溶液以及NTC-2號溶液之混合比例介於體積比1 : 1至1 : 5之間。



